

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

JULY 5, 1991

MEMORANDUM

SUBJECT: Applicability of the "Mixture" Rule To Petroleum Refinery Wastewater Systems

FROM: Sylvia K. Lowrance  
Office of Solid Waste

TO: Director, Waste Management Division  
Regions I - X

Last fall, EPA added two wastes, F037 and F038, generated in the treatment of petroleum refinery wastewaters to the list of hazardous wastes under 40 C.F.R. 261.31 (55 Fed. Reg. 46354, November 2, 1990). Since then, we have received requests for clarification concerning the application of the "mixture rule" to these listings. This memorandum is intended to provide guidance on this question.

In a December meeting with the American Petroleum Institute (API) and my staff, API discussed what it viewed as a potential conflict between the language of the listing that limits the listed wastes to those generated upstream of aggressive biological treatment units and the preamble discussion of the interaction between the "mixture rule" and the listing. API explained its fear that introduction of a particle of the sludge to non-hazardous wastewater would taint the wastewater and thus convert any downstream units into hazardous waste treatment facilities.

The discussion of the mixture rule in the preamble to the final regulation does not reflect any change in the Agency's position about how the mixture rule works and the circumstances in which a non-hazardous wastewater, i.e., non-listed wastewater, that generates a listed waste would become hazardous.

In response to an expression of concern about this matter in comments filed on the rule, EPA (Response to Comments Background Document) indicated as follows:

With respect to the commenter's concern that all downstream units would be regulated as hazardous as a consequence of application of the mixture rule, the Agency feels that the following points should be made. Generation of a waste does not occur until deposition. It is Agency policy that no mixing occurs in a wastewater treatment unit that manages a non-hazardous [nonlisted] liquid waste even if that liquid generates a

hazardous sludge that settles to the bottom of the unit, unless that sludge is in some way dredged up and physically mixed with the liquid. If the Agency did not interpret the mixture rule in this manner, there would be no point in carefully limiting listings to include sludges but exclude wastewaters. The position of the Agency in expanding the listing was to ensure the regulation of similarly composed sludges, regardless of where they are generated.

This is consistent with EPA's previous discussions of the applicability of the mixture rule with respect to petroleum refinery wastewater separation sludges. (See attached December 7, 1984 Office of Solid Waste and Emergency Response Memorandum, Subject: Region VIII Policy for the Permitting of Refinery Oily Wastewater Treatment Ponds). Further, the Agency's position is fully explored in the extended discussion of the rule in the final rule concerning the delay of closure for hazardous waste management facilities. See 54 Fed. Reg. 33376, 33387 (August 14, 1989). There, the Agency rejected the position that when non-hazardous waste and a listed hazardous waste are co-mingled and co-managed in the same unit under any circumstances, the entire mixture is considered a listed waste.

The Agency has consistently interpreted the mixture rule not to apply where a non-listed waste is discharged to a unit (i.e., surface impoundment) even if that liquid generates a hazardous sludge, unless the sludge is in some way "mixed" with the liquid (e.g., scoured as a result of operations in the unit). If the Agency did not interpret the mixture rule in this manner, there would be no point in carefully limiting listings to include sludges but exclude wastewater.

The discussion goes on to recognize that there is a continuum between sludge, the sludge/liquid and the liquid. Within the sludge/liquid interface there may be some mixing but not "mixing" so as to convert the liquid from non-hazardous waste to hazardous. Only in the event of scouring or other physical mixing would the mixture rule come into play.

Were any mixing to occur, it would be confined to the liquid/sludge interface. Levels of hazardous constituents escaping from the hazardous sludge to the non-hazardous liquid are not likely to pose an appreciable risk to human health and the environment. Should the impoundment be dredged so that scouring or other physical mixing occurs, the mixture rule would come into effect. 54 Fed. Reg. 33388.

Under the policy explained above, for example, it is unlikely that any increased turbidity associated with the introduction of water from storm events would create the necessary scouring or physical mixing described above so as to convert non-hazardous wastewater to hazardous. Similarly, for example, the small amount of resuspension of primary sludge associated with the normal operation of a properly designed wastewater treatment system would not render the wastewater hazardous.

cc: RA's Region I-X  
Richard Witt (LE-132S)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

DECEMBER 7, 1984

MEMORANDUM

SUBJECT: Region VIII Policy for the Permitting of Refinery Oily Wastewater Treatment Ponds

FROM: John He Skinner, Director  
Office of Solid Waste (WH-562)

TO: Robert L. Duprey, Director  
Region 8  
Air and Waste Management Division (8AW-WM)

We have reviewed the proposed Region VIII position discussed in your memos dated May 1 and October 12, 1984 that define permitting coverage of refinery wastewater treatment ponds. As your staff may have informed you, there have been several meetings between my staff and yours to discuss this problem. We have also met with Chevron, Phillips, Tosco and API and, separately, with Region IX to discuss the issue. We share your concern about the threat posed to ground and surface waters by some of the unlined wastewater ponds that treat or store oily wastewaters. However, we believe that the similarity of downstream unit sludges (in terms of lead and chromium levels) to those found in the API Separator are not a sufficient basis for defining the material in the downstream units as API Separator Sludge. In fact, the similarity of these sludges was a significant factor in our decision to move forward on an expanded listing to regulate these pond sludges.

Specifically, we are planning in a forthcoming listing to regulate oil/water/solids separation sludges generated in the wastewater treatment system prior to biological treatment. This listing was originally proposed in November of 1980. We expect to issue a notice identifying all of the available data in support of the listing and to provide some clarifications in response to previous comments. Current plans are to promulgate that listing by late summer.

While the listing revision should cover most sludges generated in these ponds, we realize that does not address your short term problem. We do have some suggestions in this regard. Section 206 of the Hazardous and Solid Waste Amendments of 1984 provides that persons obtaining RCRA permits must undertake corrective action for all releases of hazardous constituents from any solid waste management unit as a condition of obtaining the RCRA permit. Thus, if a refinery pond is releasing hazardous constituents and the refinery seeks a RCRA permit for any unit at that facility, the refinery would have to undertake corrective action for the releases from the pond. (This could be done either through the permit, or pursuant to an interim status compliance order.) This principle applies even if the pond is not considered to hold a hazardous waste, since Section 206 applies to releases of hazardous constituents from solid waste management units.

A second option for addressing these pond sludges is to regulate the wastes as hazardous based on their exhibiting one or more of the characteristics of hazardous waste (see 40 CFR §261.21 -24). You mentioned this option in your recent letter with respect to EP Toxicity. However, your staff seems to have overlooked corrosivity (high pH has been found in some COD ponds) and reactivity (§261.23(a)(5)). It is likely that some refinery pond sludges will contain excessive levels of reactive sulfides.

The final option that could be used to deal with downstream impoundments and basins is applicability of the mixture rule. It is imperative, however, that your staff understand the proper framework for the application of the mixture rule. To maintain that a pond is regulated because an API Separator is an inherently inefficient unit and allows sludge to be carried through to a pond, is inaccurate. Likewise, downstream oxidation ponds are not regulated simply because they sometimes receive flow that has bypassed the API Separator. In both cases, the listed API Separator Sludge has not yet been generated. Rather, API Separator Sludge is generated when it is deposited in the bottom of an API Separator. The mixture rule is relevant only in those cases where previously deposited sludge is scoured, resuspended, and then carried out of the unit with the wastewater. If the Region can make a case for scouring from a separator, the mixture rule is applicable and the wastewater becomes a hazardous waste until delisted or discharged to a stream subject to regulation under the Clean Water Act.

The burden of proof in the demonstration of scouring is upon the Agency. Such an argument, although technically complex, can be made based on well established hydrodynamic principles. Realizing that there are limited resources and capability for developing such an argument by the Regions, we have (at the request of your staff) taken an active role in the development of guidance for the application of this argument. Attached to this memo is a preliminary list of factors that may be required to establish the occurrence of scouring from a given separator. These points are being provided at this time to facilitate the initiation of information gathering in the more serious cases.

We have also requested that the Office of Waste Programs Enforcement (OWPE) develop more thorough guidance. That effort is being conducted by their contractor (Metcalf & Eddy). We anticipate that your staff will be contacted by them in the near future. The contractor should be able to provide some direct assistance to your staff in some specific cases, thereby serving the dual purpose of training and resolution of specific factors of concern. Mike Barclay (FTS: 475-8727) of OWPE is the Headquarters lead on that project and should be contacted for any further information. Ben Smith of my staff (FTS: 475-8551) is our technical expert in this matter and the lead on our study of petroleum refineries and their wastes. Do not hesitate to contact him if additional questions arise pertaining to this or other matters.

cc: RA's Region I-X  
Mike Barclay (OWPE)  
Steve Silverman (OGC)  
Susan Manganello (ORC, Region VIII)

## Factors To Be Evaluated In Determining The Potential For

### Separator Sludge Scouring

- Sludge Accumulation Practices - Continuous sludge removal from the separator rules out the occurrence of scouring. At the other end of the spectrum are facilities that allow sludge to accumulate to considerable depth. Accumulation to a depth greater than 50% of the flow depth makes scouring probable. Intermediate ranges of accumulation will probably depend more heavily on other factors.
- Flow Variability - Unless overloaded, units with maximum-to-minimum, flow ratios at the separator effluent of less than 2 and inlet flow ratios of less than 4 are probably not experiencing much resuspension of sludge.
- Poor Separator Design or Operation - Factors contributing to scour conditions include: excessive, inlet or outlet zone turbulence; nominal horizontal velocities greater than 30 feet per minute; nominal overflow rates (flow/ surface area) greater than 10,000 gallons per day/square foot of basin; basins less than 30 feet in length; operation under pressure (e.g., with a backwater at the inlet of a separator with a frozen surface), settling zone turbulence (sometimes seen as bubbling with solids entrainment).
- Separator Effluent Characteristics - Excessive weir loadings (e.g., operation with a suppressed weir, flow depth greater than a foot) facilitate carryover of resuspended particles. Visible, large (diameter greater than 1/4 inch) sludge particles in the separator effluent are strong evidence of scouring associated with microbial degradation of deposited sludge.
- Sludge Characteristics - Particle size distribution as measured by wet sieve and hydrometer analyses is necessary information to define scour conditions. The presence of coke fines in the wastewater influent is also important because that size of particle (<.1mm) is non-cohesive and highly susceptible to resuspension.